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Low risk-free rates and their implications for valuation

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Abstract

The paper discusses implications of prevailing low interest rates on discounted cash flow valuations. Applying the traditional theoretical framework can lead to absurd results for intrinsic value. I find evidence that investment banks use artificially high numbers for risk-free rates and equity premia to boost weighted average cost of capital. I argue that valuations that are solely based on discounted cash flows lack meaningfulness in the current environment. They need to be accompanied by other techniques such as multiple valuations. In Lisa and mine valuation of Wacker Neuson SE we did not only "sanity-check" the DCF price target but used an equally weighted blended price target of DCF and multiples as a result of these findings.

Keywords (up to four)
Risk-free rate, weighted average cost of capital (WACC), Discounted cash flows, Equity risk premium

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The cost of capital is one of the most important numbers in corporate finance and the investment world. Correctly applied, it helps managers to decide which projects to pick and it helps investors to buy the right stocks (Miller & Modigliani, 1958). While the general theoretical framework is basically agreed on in the academic and practitioner world, different design choices seem to be applied by users which can influence the outcome. We experienced first-hand, that inputs are not always as obvious as they seem to be. More important, within our sensitivity analysis for our discounted cash flow model, we recognized how sensitive the enterprise value is for changes in the cost of capital when using the Continuing Value formula by McKinsey (McKinsey, Koller, Wessels, Goedhart, 2015).

Table 1: Sensitivity Analysis on DCF valuation of Wacker Neuson SE

Sensitivity Analysis						
		WACC				
	1468	4,3%	4,8%	5,3%	5,8%	6,3%
TV Growth	2,4%	35,6	26,3	20,3	16,0	12,8
	2,6%	38,1	27,3	20,6	16,0	12,6
	2,9%	41,5	28,5	20,9	16,0	12,4
	3,1%	46,3	30,1	21,4	15,9	12,2
	3,4%	53,7	32,2	21,9	15,8	11,9

Values in EUR, as of 2nd January 2020, Valuation performed by Lukas Müller & Lisa Preußler

Recapping quickly, the cost of capital represents the weighted costs that a company needs to pay to its owners and debtors to compensate them for giving capital to the company. Economically, it is the opportunity cost for investors that need to forego other projects with similar risk/return metrics in order to pick the one at hand. Pratt and Grabowski (2014) state that it needs to equal the return that could have been earned on an alternative investment at a specific level of risk. A company has two major sources of capital, debt and equity. The generalized formula for the weighted cost of capital follows as (Ross, Jordan, Westerfield, & Jaffe, 2013):

$$WACC = \frac{E}{E+D} * r_e + \frac{D}{E+D} * r_d * (1-t)$$

with E being the market value of equity, D being the market value of debt, r_e being the cost of equity, r_d being the cost of debt and t representing the tax rate. As the WACC is equivalent to the discount rate in the discounted cash flow model, minimizing WACC maximizes value, ceteris paribus. The cost of equity can be found by applying following formula:

$$r_e = r_f + \beta * (r_m - r_f)$$

with r_f being the risk-free rate, β the sensitivity of the equity value to changes in a broad portfolio of investments and r_m the return of a market portfolio that consists of all available investment opportunities. Conceptually, the cost of debt is captured by:

$$r_d = r_f + credit\ spread$$

where the credit spread reflects the required compensation of a specific project or company above the risk-free rate.

It becomes clear that the risk-free rate is an integral part of both equations and with that of the overall WACC. When comparing the forecasts of the operations of Wacker Neuson with consensus data from Bloomberg, we realized that our estimates were below the average analyst estimates. However, we still arrived at a DCF based price target above some other analyst's price targets. We wondered how that is possible and quickly came to the conclusion that our WACC has to be below that of other analysts. To check, whether our suspicion is correct, I checked the last 10 published research reports by two of the biggest equity research providers for German small and mid-caps: Berenberg and Warburg Research.[1] The following table shows the result compared with market rates observed at the time of writing.

[1] The author worked as an intern at Berenberg and has access to the Equity Research platform. For Warburg's report I looked at mandated research that is published on the company's homepage.

Table 2: Input Overview Competition

Provider	Company	Date	Risk-free	Equity Risk Premium	3m German Bund	10y German Bund
Berenberg	KPS AG	19.09.19	1.0%	7.0%	-0,65%	-0,51%
Berenberg	technotrans	22.08.19	1.0%	7.0%	-0,70%	-0,65%
Berenberg	Stemmer	27.06.19	1.0%	7.0%	-0,54%	-0,32%
Berenberg	1&1	08.05.19	1.5%	6.5%	-0,56%	-0,05%
Berenberg	Cyan	03.05.19	1.0%	7.0%	-0,54%	0,02%
Warburg Research	PNE Wind	02.10.19	1.5%	7.0%	-0,59%	-0,55%
Warburg Research	KTM Industri	20.06.19	1.5%	7.0%	-0,54%	-0,32%
Warburg Research	Freenet	04.07.19	1.5%	7.0%	-0,56%	-0,40%
Warburg Research	Axel Springe	24.04.19	1.5%	7.0%	-0,55%	-0,01%
Warburg Research	Jungheinrich	11.04.19	1.5%	7.0%	-0,54%	-0,01%

The numbers used by the analysts are at odds with market rates and with academia. For our valuation, we opted already for 5-year averages of risk-free rates to arrive at our risk-free rate. However, Professor Filipa Frade de Castro[2] indicated that one- or three-month rates would be the most appropriate approximation of risk-free rates. Applying the 3-month yield on German bunds[3] of -0.68% in our DCF valuation yields a fair value per share of EUR 68.0 versus a current price of EUR 17.29[4]. We rejected this price target as unrealistic. Bernstein Research, one of the most renowned research provider for the US[5], has published a note in 2016 that DCF models do not work in a world with near-zero or even below zero risk-free rates.[6] They argue that this trend shifts too much weight to terminal values where forecasting errors that naturally occur when estimating the future 10 years out, are magnified by low discount rates. What analysts at Warburg and Berenberg and probably many other investment banks do is just using higher risk-free rates than currently observed by markets and using very high equity risk premia that push up the cost of equity and the WACC. This leaves me with two questions: Do models

[2] In her forum answer to: "Negative risk free rate", from 31st October, 2019 (opened at 02/01/20)
[3] https://www.marketwatch.com/investing/bond/tmbmbde-03m?countrycode=bx (opened at 02/01/20)
[4] Bloomberg, Opening Quote of 2nd January, 2020
[5] See numerous prices they have won on their homepage: https://www.bernsteinresearch.com/brweb/Public/Login.aspx?ReturnUrl=%2fbrweb%2fHome.aspx%3fsrc%3dlogin&src=login
[6] https://ftalphaville.ft.com/2016/10/13/2177209/bernstein-sets-itself-against-the-dcf-model-in-a-zero-rate-world/

really break down with below zero rates and what does this behavior by market participants mean for investors (and analysts like us) trying to value stocks based on a DCF model?

Lowering WACC and keeping all other inputs equal has heavy impact on the value of an asset which is shown in Table 1. Technically, the model does only work as long as growth is smaller than WACC, logically, the model will already produce unrealistic outcomes when the difference of those numbers becomes too narrow as terminal values skyrocket. However, one can argue that risk-free rates and their implications for WACC cannot be analyzed in isolation. Below zero interest rates for German debt are a result of stubbornly low inflation and economic growth in Europe. The persistence of low interest rates and the flatness of the yield curve are example for investor's expectations that we will see low growth and inflation for longer. These circumstances will limit the company's long-term growth rate as this rate will eventually correlate closely with overall growth in the economy. For us, this means that we need to care deeply about the long-term growth rate of the business and understand where its limits are. Our considerations are reflected in the 2.9% terminal growth rate that takes into account rather slow growing economies like Europe and more dynamic economies like USA and China where a lot of future growth of the company will be generated. At these levels, we feel confident that our expectations and the cost of capital are inherently consistent and produce a reasonable estimate of the fair value of the company.

The answer to the second question is even more difficult to find. Even though, we trust our model and its result, it remains doubtful whether we should act on it. From Table 2 we have concluded that some market participants seem not to act in harmony with financial theory. This means, that even if all our estimates turn out to be correct (close to impossible), our price target might not be reached because all other market participants agreed on demanding higher compensation for providing capital to Wacker and with that are willing to pay less per share than our defined value. In consequence, we opted for a dual-method approach that mitigates

potential problems with DCF-based valuations in the current market environment. Standalone DCFs lack meaningfulness but accompanied by relative valuations we think they do add value to an overall valuation. We believe that this approach is currently the most robust one as standalone relative valuation cannot provide enough detail about how the business is developing versus its peers in the future.

In general, I note that the implications of negative risk-free rates and comparably low WACCs are not discussed in academia[7]. While the timeframe for studies is still short[8], one can look at how capital asset pricing models performed in forecasting stock returns in Japan where low interest rates have been reality for many more years. For asset manager, and stock pickers especially, those studies could provide enormous inside on the question if their selection process is still appropriate. For capital allocators within companies, it could provide a better guidance for capital budgeting since they are at risk to forego a lot of value-creating projects when applying a too high hurdle rate.

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[7] Searches at Google Scholar do not find any relevant articles

[8] German 10y bonds first turned negative in June 2016: https://www.bloomberg.com/quote/GTDEM10Y:GOV